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Life-course dynamics: A research program in progress from the Netherlands.

Schroots, J.J.F.

published in

European Psychologist
2003

DOI (link to publisher)

[10.1027//1016-9040.8.3.192](https://doi.org/10.1027//1016-9040.8.3.192)

document version

Publisher's PDF, also known as Version of record

[Link to publication in VU Research Portal](#)

citation for published version (APA)

Schroots, J. J. F. (2003). Life-course dynamics: A research program in progress from the Netherlands. *European Psychologist*, 8(3), 192-199. <https://doi.org/10.1027//1016-9040.8.3.192>

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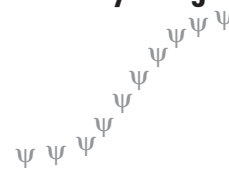
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Life-course Dynamics

A Research Program in Progress from The Netherlands

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In the Dutch research program "Life-Course Dynamics" three projects in progress are presented which study the self-organization of behavior over the course of life at different levels of theorizing on the basis of a longitudinal data set, generated by means of the Lifeline Interview Method (LIM). The first project describes different aspects of the dynamic structure and content of individual lives. It was found among other things that the structure of life is dominated by the Principle of the Constant Life Perspective, i.e., the sum of past and future autobiographical events, is constant over the lifespan, while their relation changes systematically with age. Content analysis and compression of the LIM data set of life events resulted in the composition of six modal "self-portraits" with regard to both past and future of young, middle-aged, and older men and women, respectively.

Keywords: Lifespan psychology, dynamics, aging, autobiographical memory, life events.

The second project, based on the principles of gerodynamics and branching theory, studies how people manage their lives, and how they cope with transformations and react to affective-positive and negative life events. To this end, the content of the LIM narratives needs to be examined in terms of experienced past and expected future, age, gender, transformations, events, and affect, and in relation to measures of personality, coping, and locus of control.

The third project studies autobiographical memory as a dynamic system of both retrospective and prospective memory, subject to continuous changes across the lifespan. It was found among other things that processes of development and aging account for the autobiographical memory "bump," and that these processes might also account for the differential course of other neurobehavioral functions.

Introduction

Development and aging are both dynamic processes. Traditionally, development and aging are thought of as two successive processes of change, with the transition or apex at maturity. These traditional conceptions can be reduced to the implications of the well-known Gompertz or mortality curve for population data (Gompertz, 1825). From this perspective, development is compared with incremental processes of change (e.g., biological growth) and aging with decremental processes or senescence. The classic metaphor for these processes is that of the "hill" (Schroots, 1991). For a few decades, however, the notion has been growing that psychological processes of change do not necessarily parallel biological changes along the lifespan. The psychological attribute of wisdom, for instance, represents a progressive aspect of change in middle and late adulthood and challenges the traditional decline view of aging (Brugman, 2000). A major crossdisciplinary question, then, concerns the dia-

chronic and synchronic relations of development and aging.

In this research program, three projects are presented which study the dynamics of development and aging from a psychological perspective. This dynamic approach considers the self-organization of behavior over

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the course of life (Schroots & Yates, 1999), i.e., *Life-Course Dynamics*. The three projects, which are in various degrees of progress, are all based on a longitudinal data set, generated by means of the Lifeline Interview Method (LIM) (see below). Because of a chronic lack of funds, only part of the cross-sectional data set (first wave) has been analyzed. Plans are developed for the analysis and reporting of the full data set.

Lifeline Interview Method

The LIM has been developed purposively to study the subjective or self-organization of past and future behavior over the course of life. With the term "subjective" we mean the perception by the individual of his or her life, which implies some sort of retro- and prospective memory for life events, experiences, and/or expectations (Maylor, Darby, Logie, Della Sala, & Smith, 2002), as well as some sort of reflective and integrative capacity for these events. As Lakoff and Johnson (1980) have demonstrated convincingly, metaphors are language tools *par excellence* for people to describe their life histories and expectations for the future. Metaphors allow us to map what we know onto what we vaguely know and give rise to new concepts and integration.

Taking the "mapping" function almost literally, the question arises as to which metaphors would be useful for the study of lives. From the plethora of metaphors, three potential metaphors of life were selected, i.e., the "tree," the "river," and the "footpath" (Schroots, 1984; Schroots & ten Kate, 1989). The tree as a metaphor of life needs hardly explanation; in the literature one can find numerous analogies between the annual cycle of growing, budding, blooming, shedding leaves, and dying on the one hand, and the individual life cycle on the other hand. The "branching tree" as metaphor of life is another example in which the branching points symbolize the events, experiences, and happenings that significantly affect the direction of individual lives. Although the tree as a metaphor of life is very powerful, there is one serious flaw: The tree is basically a spatial metaphor that only vaguely suggests some kind of dynamics.

When older people are asked to describe their life, they frequently use metaphors like the "river" or "footpath" (Vischer, 1961). The river symbolizes the stream of life, and the footpath stands for the journey one makes from birth to death, when one alternately crosses the mountains and valleys of life. Both metaphors enclose the previously mentioned dynamic dimension, but only

the "footpath" metaphor refers explicitly to the, likewise, important dimension of affect. For example, when people say "I'm feeling up" or "I'm really low these days," they are using a spatial metaphor, i.e., hilly country, to express the positive and negative feelings they have in life.

From the "footpath" metaphor to the LIM as autobiographical method, i.e., instrument or technique, is only one step as soon as one recognizes the mapping function of metaphors. Literally, the graphical, two-dimensional representation of a footpath—with time on the horizontal dimension and affect on the vertical dimension—symbolizes the course of human life with its ups and downs of important life events. Several experimental versions of the LIM have been tested over a period of 20 years. Below we describe the final version of the LIM, as used for the first wave of data collection in 1995 (Schroots & Assink, 1998).

Material

In a typical LIM session the respondent is shown a board with a blank piece of paper, A4 format (landscape), on which a grid is printed. The grid consists of a bottom and top line (300 mm), connected by two solid lines and one dotted vertical line of equal length (185 mm) at 0 mm, 185 mm and 300 mm from the origin, respectively. The space left from the vertical line at 185 mm is meant for drawing the past lifeline; the space right from the vertical is meant for the future lifeline (for a graphical example, see Schroots, 1996).

Administration

After presenting three examples of past lifelines, from simple to complex, we asked the respondent (a) to draw without much thought his/her own lifeline for the past from birth dot (middle of vertical line, 0 mm) to his/her calendar age (vertical line, 185 mm); (b) to label each peak and each dip, i.e., the series of life events, by chronological age and to tell briefly what happened at a certain moment or during an indicated period; and (c) to describe afterwards the series of life events in more detail, i.e., the life story (b + c). After the past lifeline has been labeled and described, the future is explored in the same manner. Starting from the age point where the past lifeline has stopped, the respondent is asked to continue the line until the dotted age-line (300 mm) of expected death and then to label and describe the peaks and dips of the future lifeline.

Subjects

Longitudinal data on the LIM have been collected in three waves (1995/1996; 1997/1998; 2000/2001) for a sample of 98 respondents, 47 males and 51 females, drawn in almost equal numbers from three age groups: early, middle, and late adulthood. The mean ages and age ranges for the three groups are 23.5 (18–30), 43.3 (31–55), and 67.3 (56–84) years, respectively. The subjects are Caucasians of primarily middle to higher socioeconomic status, recruited initially from educational and health organizations in two Dutch metropolitan areas and then sampled by means of the snowball method. Plans for a new wave of data collection in 2005/2006 are in progress.

Summary of Results

Project 1: Structure and Content of Lives

In the last decade, the narrative approach in psychology has become prominent in studying the self and individual lives (McAdams, 1996). This approach is based on the assumption that people construct and reconstruct their lives continuously in order to give meaning to life events and to integrate new experiences. Traditionally, qualitative data obtained via narrative, biographical methods are difficult to analyze in a reliable manner (Rowles & Schoenberg, 2002). Moreover, generalization of the findings faces numerous difficulties. To overcome these problems, several experimental versions of the LIM have been tested. The final version of 1995 forms the basis of a longitudinal study in which both quantitative and qualitative information is systematically collected about the self and the lives of young, middle-aged, and older adults at three levels of information: (a) lifeline, (b) life event, and (c) life story.

Starting from the LIM longitudinal data set, the first project aims to describe different aspects of the dynamic structure (lifeline, life events) and content (life events, life story) of individual lives. In psychometric terms this means that the construct validity will be explored, via standard multigroup longitudinal factor-analysis of LIM data in relation to both personality questionnaires (administered after each LIM session) and published data from comparative studies. In the following, some results of the first wave (1995/1996) are reported in summary form.

LIM/Lifeline: A Comparative Study of Structure (Schroots & Assink, 1998)

LIM data were analyzed in relation to published data on the Timeline (TL; deVries & Watt, 1996), the Life Drawing (LD; Whitbourne & Dannefer, 1985/1986), and the Life Graph (LG; Bourque & Back, 1977) from the structural perspective of autobiographical memory, temporality, and typology, respectively. Generally, the distribution of life events on the LIM and TL follows the same pattern. Overall, individuals specified an average of 7.03 events on the LIM, while the oldest group had a greater number of past events than the youngest group, who specified more future events. Temporal dominance for LIM and LD changed across the lifespan, from present and future dominance (youngest group) to past dominance (oldest group). The same four factors were extracted for LIM and LG, which represented the four stages of life, respectively: adolescence, early adulthood, late middle age, and old age. An additional factor was extracted for the LIM only, called "Experience." Discussion focused on the robust structure of the LIM/Lifeline. Surprisingly, the comparative study could be concluded with the new, autobiographical "Principle of the Constant Life Perspective," i.e., the sum of past and future autobiographical events is constant over the lifespan, while their relation changes systematically with age.

LIM/Life Story: A Comparative Content Analysis (Schroots & Assink, in press)

LIM data were compared to published data on the Timeline (TL) concerning number, affect, and content of life events. In order to classify LIM events, a category list has been developed including 40 subcategories divided over nine categories: Relations, School, Work, Health, Growth, Home, Birth, Death, and Other. For both LIM and TL, event type varied by age and gender. Because of methodological differences, comparative LIM and TL data could not be analyzed completely. Consequently, LIM data were partly reported independent of TL data. This resulted, among other things, in the construction of life-course sketches for men and women of different age groups on the basis of most frequently mentioned life events. It is concluded that there is a need for a standard method for the content analysis of autobiographical material, which might be provided in the course of the LIM research program.

The Distribution of Affect over the Lifespan (Assink & Schroots, in press)

This study focuses on the effect of age and gender on the distribution of affect over the lifespan. For the measurement of affect the LIM was selected, a special method for eliciting autobiographical information about important life events for both past and anticipated future. Results are reported for 98 men and women about equally divided over three age groups (young, middle, and older adulthood). Overall, participants reported as many positive as negative events. The older participants are, the more positive they feel about their past and the more negative they feel about their future. Young participants, especially women, are very optimistic about their future. With regard to the distribution of affect over the lifespan, a so-called "positive affect bump" was found for the middle- and older-age groups who reported relatively more positive events in the period of about 10 to 40 years of age than in other periods of life.

Portraits of Life: Patterns of Events over the Lifespan (Schroots & Assink, submitted)

As demonstrated at length in the literature on qualitative research (Denzin & Lincoln, 2000), content analysis may result in categorical data tables that are difficult to present in a convenient and orderly manner. The major aim of this explorative study in progress is to compress the LIM data set of life events (first wave) in such a way that so-called "portraits of life" are created for both past and future of young, middle-aged, and older men and women. To this end, the frequency distributions of life events per decade are analyzed in relation to their affective value. Next, the most "typical" life events (i.e., the most frequently mentioned events) are ordered per decade in the form of written statements about the past and future of the individual. Finally, the chronological composition of these concrete statements into a self-portrait produces the modal life story of six groups of individuals, differentiated by age and gender.

Project 2: Self-Management over the Lifespan

Contrary to the explorative nature of Project 1, this project—now in progress—is based on the principles of gerodynamics (dynamic systems theory of aging) and branching theory (Schroots, 1995), which—briefly summarized—imply that living systems are continuously

fluctuating and achieve dynamic stability. Gerodynamics hypothesizes that internal or external fluctuations of nonequilibrium systems can pass a critical point—the transformation point—and create order out of disorder through a process of self-organization (cf. Prigogine, 1979).

According to the new branching theory, branching points, i.e., turning points or transformations, may be defined as those changes in the life of the individual which direct the life-course distinctly, and which are separated in time by one or more affective, important, or critical life events, experiences, or happenings (Birren & Deutchman, 1991). Thus defined, the LIM/Life story may be conceived as a series of narratives from birth to (expected) death, of which the content can be analyzed in terms of the so-called "branching model of transformations." The core of this model is the fluctuating behavior of the individual, which can pass a transformation point and branch off into higher- and/or lower-order behavior. Generalizing, higher-order behavior stands for growth and development or higher life expectancy; lower-order behavior stands for senescing and aging or lower life expectancy. In this context, the concept of life expectancy (related to mortality or the probability of dying) needs to be operationalized in terms of morbidity (disease, disorder, disability, or dysfunction) and quality of life (well-being or life satisfaction). Contrary to what might be expected, negative life events (e.g., illness or divorce) do not always result in lower-order behavior, i.e., some people are strengthened by illness, and divorce may have a positive rather than a negative effect on mental health. A major issue, then, concerns the process analysis of (differences in) self-management (Boekaerts, Pintrich, & Zeidner, 2000), i.e., the dynamic organization of higher- and lower-order behavior over the course of life.

Starting from the LIM data set at the event and story level, this project studies how people manage (control, regulate) their lives, and how they cope with transformations and react to affective-positive and negative life events. To this end, the content of their life stories (narratives) needs to be examined in terms of experienced past and expected future, age, gender, transformations, events, and affect; transformations and events need to be coded into meaningful categories, varying from life themes to ratings of higher- and lower-order behavior (see also Schroots & Assink, in press). Finally, the findings need to be related to personality measures, i.e., questionnaires (NEO, coping, locus of control, future perspective, and well-being), which were administered after each LIM session.

Project 3: Autobiographical Memory (AM)

AM can be broadly defined as a type of episodic memory for information related to the self, both in the form of memories (past events) and expectations (future events). As such, AM corresponds generally to classic principles of remembering and forgetting (Bartlett, 1932; Conway, Rubin, Spinnler, & Wagenaar, 1992; Galton, 1883). Contrary to these principles is the “bump” phenomenon of disproportionately higher recall of memories for the period of 10 to 30 years, as observed systematically in individuals older than about 35 years. This is the period from which peoples’ favorite films, music, and books come, and the period from which they judge the most important world events to have originated (Rubin, 2002; Rubin, Rahhal, & Poon, 1998). So far, a satisfactory explanation for the bump is missing, but two theoretical accounts represent a defensible point of view. The first, a cognitive account, emphasizes the novelty of experiences occurring during the bump period of life transitions from rapid change to stability; the second, an account of identity formation, is based on the preferential retention of events from a period of consolidation of the self (Conway & Pleydell-Pearce, 2000). Both accounts derive their interpretative power mainly from descriptive evidence, but fail to give an explanation for the emergence of the bump over the lifespan. In the following, a dynamic account will be presented with theoretical implications for the “Life-Course Dynamics” research program.

Autobiographical Memory Across the Lifespan (Schroots & van Dijkum, in progress)

This comparative study (three age groups, three measures) explores the distribution of retrospective and prospective autobiographical memory data across the lifespan (Graf, Uttl, & Dixon, 2002), in particular the “bump” pattern of disproportionately higher recall of memories from the ages 10 to 30, as generally observed in older age groups. The empirical data patterns of three memory measures (LIM, TL, and Life event sorting task) confirm the universality of the “bump” for older adults, but suggest also that the increase of memories in younger and middle-aged adults is overshadowed by memories for recent events. In search of an explanation for these patterns, a theoretical outline (Whitehead, 1929) is presented about the flow of time and the relations between the (subjective) past, present, and future. Whitehead’s controversial thoughts offer the first clue for the study of autobiographical memory

as a dynamic system of both retrospective and prospective memory, subject to continuous changes across the lifespan.

Autobiographical Memory: A Dynamic Lifespan Model (Schroots & van Dijkum, in progress)

Earlier, we came across some empirical findings that support a dynamic account of the autobiographical memory bump. In a comparative study of three age groups (young, middle-aged, and older adults) with two different AM measures (LIM and TL) for both past events and future events, we reached the conclusion that the relationship between past and future events changes systematically with age, while their sum is constant over the lifespan (principle of the constant life perspective; see also Schroots & Assink, 1998). After converting the numbers of events into percentages per age group, we then hypothesized that the ratio of past or future events and their sum with age follows a power curve in which there is a limit to growth (or decline), i.e., the S-shaped, logistic growth or decline curve.

Mathematically, the flow from future events to past events, i.e., the dynamic relationship between past and future events, can be expressed in a simple differential equation. Computer simulation of this simple model over a period of 100 years shows that the relative distributions of past and future events follow two crossing patterns of a limited growth and decline curve, respectively, and produce a small, bell-shaped distribution of events at the beginning of the life course. Simulation of a more complex model, the so-called *Janus* model, over a period of 100 years, shows for three sets of parameters (1) a distinct unimodal distribution of events around the age of 20 years, (2) a weak bimodal distribution around age 25 and 35, and (3) a strong bimodal distribution around the ages of 30 and 60 years. The three simulated event distributions of the *Janus* model, called after the Roman god with two faces—one face looking into the future and one into the past—might then be interpreted as follows: (1) The retention and encoding curves of young adults show complete overlap, there is only one bump. (2) As people reach middle age, the retention and encoding curves seem to dissociate, a small bump emerges slowly from the original bump. (3) When people grow older, the dissociation of retention and encoding comes to an end in the form of two bumps, one for encoding, i.e., the sought-after AM bump, and one for retention of past and future events.

The crucial question arises as to the fit between the Janus model and the LIM data set. To answer this question an advanced simulation program was used that finds those parameter values in the Janus model that minimize the deviation between the model's output and the LIM data set. We have shown that the Janus model reproduces the emerging unimodal and bimodal patterns of events across the lifespan quite satisfactorily, i.e., the model's maxima are a close fit to the modus of the observed bumps in the LIM data set, *quod erat demonstrandum*.

Discussion and Conclusion

In the foregoing, we presented a progress report of a research program for the study of life-course dynamics at different levels of theorizing, varying from the level of metaphor to the level of model and theory. Essentially, the program is centered around the LIM, a simple paper-and-pencil method, which—in the final analysis—is meant to be used in clinical and nonclinical practice. In clinical practice the LIM might be used for clinical assessment (e.g., number and affective value of events as indicator for depression), but also for therapeutic interventions (Scherder, Schroots, & Kerkhof, 2002). At present, standard protocols are being developed for a series of seven sessions, based on the LIM and designed from three different theoretical perspectives: (a) cognitive-behavioral, (b) client-centered, and (c) narrative. Typical examples of use of the LIM in nonclinical practice are: career counseling, human resource management (Schroots, 2000), life review, and reminiscence work (Schroots & Assink, 2001).

From a research perspective, the LIM study has produced some remarkable results. The Janus model, for example, shows some interesting implications for the study of the relationships between development and aging. First, in our AM studies we demonstrated that processes of growth and decline offer a satisfactory account for the dynamics of the AM bump. Decisive for our argument is the notion that the sum of growth and decline is constant over the lifespan according to the simple formula: $A + R = L$ (calendar Age plus Residual lifespan equals the total Lifespan of the individual). From this perspective, growth should be interpreted as the lifelong process of development, measured in years from birth, and decline as the lifelong process of aging, which is traditionally defined in terms of survival and measured in years of residual lifespan (Birren, 1959; Comfort, 1956).

Second, if the lifespan forces of development and aging generate the AM bump via relatively more intensive encoding of information between 10 and 30 years of age, then these forces might also explain the course of other neurobehavioral functions and abilities over the human lifespan, e.g., the differential course of fluid and crystallized intelligence (Garlick, 2002). The patterns of both abilities show a rapid rise until early adulthood, followed by a period of relative stability for the crystallized abilities until the age of 60 years, but a slow decline of the fluid abilities after early adulthood. A *dual-process theory of ontogenesis* would explain the differential decline of fluid and crystallized abilities in terms of sensitivity for neural processes of growth and senescing (Schroots, 2002). Generally, the growth of the central nervous system comes to an almost complete stop in early adulthood, while the aging of the system or neuronal slowing continues to increase. As crystallized intelligence is primarily based on the full-grown storage capacity of the central nervous system, which has enormous reserves, crystallized abilities are less dependent on neuronal slowing than fluid abilities, which are primarily related to speed of information processing or neuronal slowing, rather than to informational capacity. In other words, the differential pattern of crystallized and fluid abilities over the course of life is based on a dual process of development (growth) and aging (senescing), of which the parameters determine the ontogenetic pattern.

In concluding this overview, we would like to make two observations. First, the macroperspective of the human life course is to a large extent *terra incognita* in psychology. In line with this observation, we record a substantial lack of methods and techniques to explore the organization of behavior over the course of life. By means of the LIM, we have made an attempt to study the dynamics of the life course from the "inside" by asking respondents to visualize, graph, and verbalize their lives. Second, in retrospect there is a benefit, scientifically, in deviating from the traditional research methods and techniques of hypothesis testing, questionnaire construction, etc., and following a different approach in mapping the *terra incognita* of life-course dynamics by using multitheoretical, multimethodical, and multianalytical perspectives on the same set of data. So far, the results of our research are rich and very encouraging. However, financially speaking, we have learned that an unorthodox approach in research is not always appreciated. Fortunately, the LIM falls under the category of low-budget studies, and for that reason, we are facing the future of our research program with confidence.

Acknowledgment

Much of the work reported in this paper was privately funded by ERGO (European Research Institute on Health and Aging). We are grateful to Marian Assink (Free University Amsterdam) and Cor van Dijkum (Utrecht University) for their contribution to the research program "Life-course Dynamics."

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